SÜTRON

User Manual

Connection to Beckhoff ADS serial

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SÜTRON ELECTRONIC GMBH

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1	21.09.2005	First edition
2	22.11.2005	Validation extended, chapter "Important Notes“ added, protocol parameters corrected

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1 Important Notes

1.1 Symbols

The symbols in this manual are used to draw your attention on notes and dangers.

Danger
This symbol is used to refer to instructions wich, if ignored or not carfully followed could result in personal injury.

Note
This symbol indicates application tips or supplementary notes.

Reference to source of information
This symbol refers to detailed sources of information on the current topic.

1.2 Safety Notes

- Read this manual carefully before using the operating device. Keep this manual in a place where it is always accessible to all users.
- Proper transportation, handling and storage, placement and installation of this product are prerequisites for its subsequent flawless and safe operation.
- This user manual contains the most important information for the safe operation of the device.
- The user manual, in particular the safety notes, must be observed by all personnel working with the device.
- Observe the accident prevention rules and regulations that apply to the operating site.
- Installation and operation must only be carried out by qualified and trained personnel.

1.3 Intended Use

- The device is designed for use in the industry.
- The device is state-of-the art and has been built to the latest standard safety requirements. However, dangerous situations or damage to the machine itself or other property can arise from the use of this device.
- The device fulfills the requirements of the EMC directives and harmonized European standards. Any modifications to the system can influence the EMC behavior.

1.4 Target Group

All configuration and programming work in connection with the automation system must be performed by trained personnel only (e.g. qualified electricians, electrical engineers).

The configuration and programming personnel must be familiar with the safety concepts of automation technology.

2 Beckhoff ADS serial

The Beckhoff ADS serial protocol connects TesiMod operating devices with RISC CPU and ARM9 CPU respectively and TesiPan operating devices to the Beckhoff TwinCat controller family. A serial connection via the RS232 or RS485 interface is used. The serial ADS driver has to be installed on the controller.

The Beckhoff ADS serial protocol supports the synchronous services.

The programming software takes the data objects of the file [NAME].TPY which is generated as a XML file automatically.

The connected control unit accesses both to a data object both via the symbolic name and directly to addresses.

2.1 Data Types

Direct access is possible to the following data types.

Table 2-1 Data types for Beckhoff ADS serial

Data Type	Index Group(s)		Index Offset	Value Range	Size
BOOL	Inputs	0x000F021	0x00000000 to 0xFFFFFFFF	0 / 1	8 Bit
	Outputs	0x000F031			
	Flags	0x0004021			
	Inputs	0x000F020			
	Outputs	0x000F030			
	Flags	0x0004020			
	Data Block	0x000F003	0x00000000		
BYTE	Inputs	0x000F020	0x00000000 to 0xFFFFFFFF	0 to 255	1 Byte
	Outputs	0x000F030			
	Flags	0x0004020			
	Data Block	0x000F003	0x00000000		
DATE	Data Block	0x000F003	0x00000000	D#1970-01-01 to D#2106-02-06	4 Byte
DATE_AND _TIME / DT	Data Block	0x000F003	0x00000000	DT#1970-01-01-00:00 to D#2106-02-06-06:28:15	4 Byte
DINT	Inputs	0x000F020	0x00000000 to 0xFFFFFFFF	-2147483648 to 2147483647	4 Byte
	Outputs	0x000F030			
	Flags	0x0004020			
	Data Block	0x000F003	0x00000000		

Table 2-1 Data types for Beckhoff ADS serial

Data Type	Index Group(s)		Index Offset	Value Range	Size
DWORD	Inputs	0x000F020	0x00000000 to 0xFFFFFFFF	0 to 4294967295	4 Byte
	Outputs	0x000F030			
	Flags	0x0004020			
	Data Block	0x000F003	0x00000000		
INT	Inputs	0x000F020	0x00000000 to 0xFFFFFFFF	-32768 to 32767	2 Byte
	Outputs	0x000F030			
	Flags	0x0004020			
	Data Block	0x000F003	0x00000000		
LREAL	Data Block	0x000F003	0x00000000	~ -1.79769313486231E308 to ~ 1.79769313486232E308	8 Byte
SINT	Inputs	0x000F020	0x00000000 to 0xFFFFFFFF	-128 to 127	1 Byte
	Outputs	0x000F030			
	Flags	0x0004020			
	Data Block	0x000F003	0x00000000		
STRING	Data Block	0x000F003	0x00000000	1 Byte per Character (Size at Declaration) +1 Byte for Zero Termination	n Byte
TIME	Data Block	0x000F003	0x00000000	T#0ms to T#71582m47s295ms	4 Byte
TIME_OF_DAY / TOD	Data Block	0x000F003	0x00000000	TOD#00:00 to TOD#1193:02:47.295	4 Byte
UDINT	Inputs	0x000F020	0x00000000 to 0xFFFFFFFF	0 to 4294967295	4 Byte
	Outputs	0x000F030			
	Flags	0x0004020			
	Data Block	0x000F003	0x00000000		
UINT	Inputs	0x000F020	0x00000000 to 0xFFFFFFFF	0 to 65535	2 Byte
	Outputs	0x000F030			
	Flags	0x0004020			
	Data Block	0x000F003	0x00000000		
USINT	Inputs	0x000F020	0x00000000 to 0xFFFFFFFF	0 to 255	1 Byte
	Outputs	0x000F030			
	Flags	0x0004020			
	Data Block	0x000F003	0x00000000		

Table 2-1 Data types for Beckhoff ADS serial

Data Type	Index Group(s)		Index Offset	Value Range	Size
WORD	Inputs	0x000F020	0x00000000 to 0xFFFFFFFF	0 to 65535	2 Byte
	Outputs	0x000F030			
	Flags	0x0004020			
	Data Block	0x000F003	0x00000000		

2.2 Programming

2.2.1 Protocol Parameters

2.2.1.1 Baud Rate

This parameter specifies the communication rate.

Table 2-2 Baud rate

Configurable values (Baud)	Default Value
9600	
19200	
38400	X
57600	

2.2.1.2 Parity

This parameter specifies the parity used to control the communication.

Table 2-3 Parity

Configurable Values	Default Value
None	
Even	X
Odd	

2.2.1.3 Data Bits

This parameter specifies the number of data bits.

Table 2-4 Data bits

Configurable Values	Default Value
5	
6	
7	
8	X

2.2.1.4 Stop Bits

This parameter specifies the number of stop bits.

Table 2-5 Stop bits

Configurable Values	Default Value
1	X
1.5	
2	

2.2.1.5 Delay until Connection Set-Up

This parameter specifies the waiting time after which the operating device starts the communication.

Table 2-6 Delay until connection set-up

Configurable Values	Default Value
5 s to 255 s	5 s

2.2.1.6 Maximum Waiting Time For Response

This parameter specifies how long the operating device waits for a response from the controller.

Table 2-7 Maximum waiting time for response

Configurable Values	Default Value
100 ms to 25500 ms	1000 ms

2.2.1.7 Connection Type

For a point to point connection only those protocol parameters are available in the dialog which are necessary.

Table 2-8 Connection type

Configurable Values	Default Value
Point to Point	X
Multiple link	

2.2.1.8 AMS Net Id

This parameter indicates the individual IP-address of the operating device. This address is also used in the telegram header of the serial protocol. However the AMS Net ID different from a normal IP-address consists of 6 group numbers. Use the IP address of the operating device for the first 4 group numbers and assign a 1 for each of the last 2 group numbers.

Example:

192.168.100.155.1.1

You can obtain the IP address of the operating device as follows:

For TesiPan devices in standard mode, 1st possibility:

1. Start the device again.
2. Read the IP address while start process (line IPAD).

For TesiPan devices in standard mode, 2nd possibility:

1. Press the service tool key (key).
2. Enter the password.
3. Click on the **IPConfig symbol**.
4. Read the IP address (line IP Address).

For ARM9 devices, 1st possibility:

1. Start the device again.
2. Read the IP address while start process (line IPAD).

For ARM9 devices, 2nd possibility:

1. Start the device again.
2. Start the launch program while booting process.
3. Navigate to the **IP Settings** button.
4. Press the **Enter** key.
5. Navigate to the **Current IP** button.
6. Press the **Enter** key.
7. Read the IP address (line IP:)

Table 2-9 AMS Net Id

Configurable Values	Default Value
000.000.000.000.1.1 to 255.255.255.255.1.1	No Default Value

Always enter the first four group numbers of the IP address with 3 digit values.
Example:
192.168.100.88.1.1 = 192.168.100.088.1.1

2.2.1.9 Port Number

This parameter specifies the port number with up to 5 digits, which is used to communicate with the operating device. You can choose the port number freely.

Table 2-10 Port number

Configurable Values	Default Value
Point to Point: 32768 to 65535 Multiple link: 0 to 65535	32768

2.2.1.10 Device Address

This parameter sets the address of the operating device and is only valid for multiple links.

Table 2-11 Device address

Configurable Values	Default Value
0 to 255	0

2.2.2 Variables List

Only those variables are put from the TPY file into the variables list of the programming software, which have the following declaration:

(*~(SuetronVar)*)

Example:

```
VAR_GLOBAL
   Input1 AT %IX30.0 : BOOL; (* ~(SuetronVar ) *)
   Output1 AT %QX30.0 : BOOL; (* ~(SuetronVar ) *)
   Output2 AT %QX30.1 : BOOL; (* ~(SuetronVar ) *)
END_VAR
```

The take-over of the variables is always carried out when the variables list is opened in the programming software.

If you made changes to the controller software and therefore created new variables or deleted variables, you have to update the variables list by opening it once again! Afterwards you have to compile the project again so that the changes are taken on.

In connection with a BX controller only **global variables** which are assigned to the areas of input (% I), output (% Q) or flag (% M) are allowed.

2.2.3 Polling Area

You should use the SINT data type If you like to use the poll area function. Please enter the start address of the data block in **Additional Functions, Polling Area**.

2.2.4 Physical Connection

Plug-in connectors on the operating device for connection to the controller.

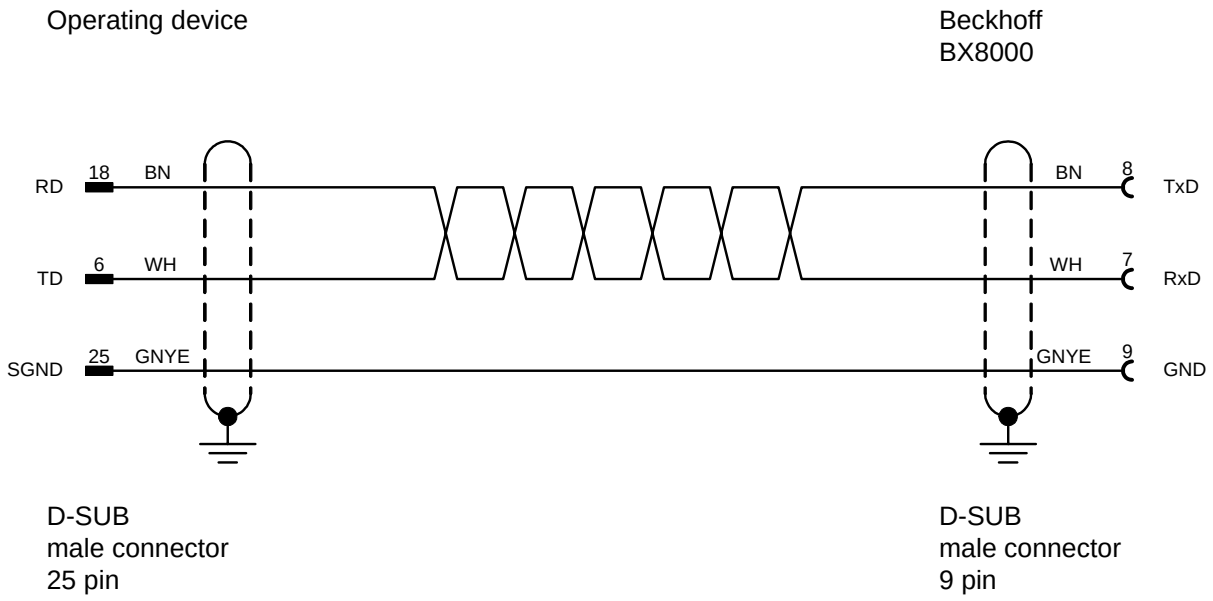
2.2.4.1 Pin Assignment for Operating Devices with an Universal Interface

Table 2-12 Pin assignment RS232

Pin	Designation	Function
6	TD	Transmitted Data
15	CTS	Clear to send
17	RTS	Request to send
18	RD	Received data
25	SGND	Signal Ground

2.2.4.2 Cabel RS232 - Beckhoff BX8000

The following cabling diagram applies to operating devices with an universal interface **only**.



Both ends of the shield are connected to the metallic housing.

2.3 Error Messages

Error messages are displayed on the operating device along with a code and subcode. Error messages are composed as follows:

Communication Error

Code XXXXX

Subcode XXXXX

Retries XXXXX

Table 2-13 Error messages for Beckhoff ADS serial

Code	Subcode	Description	Possible Cause
50	03	Framing error on serial interface	Line disturbance. Wrong baud rate.
	06	Parity error on serial interface	Line disturbance. Different parity settings for communication participants
60	10	Wrong telegram length	
	20	Wrong telegram header	Line disturbance
	40	Wrong checksum	Line disturbance
	60	Timout: no response	Line interrupt. Connection interrupt. Loading a new project. Controller not started. Connection data in the controller missing or invalid.
	70	Wrong transmitter address	A different controller transmits data to the operating device.
70		Errors from the controller The subcode contains the error number of the controller	
	0	No error	
	1	Internal error	
	2	No Rtime	
	3	Allocation locked memory error	
	4	Insert mailbox error	
	5	Wrong receive HMSG	
	6	Target port not found	
	7	Target machine not found	
	8	Unknown command ID	
	9	Bad task ID	
	10	No IO	

Table 2-13 Error messages for Beckhoff ADS serial

Code	Subcode	Description	Possible Cause
70	11	Unknown AMS command	
	12	Win 32 error	
	13	Port not connected	
	14	Invalid AMS length	
	15	Invalid AMS Net ID	
	16	Low installation level	
	17	No debug available	
	18	Port disabled	
	19	Port already connected	
	20	AMS Sync Win 32 error	
	21	AMS Sync timeout	
	22	AMS Sync AMS error	
	23	AMS Sync no index map	
	24	Invalid AMS port	
	25	No memory	
	26	TCP send error	
	27	Host unreachable	
	1280	Router: no locked memory	
	1282	Router: mailbox full	
	1792	Error class <device error>	
	1793	Service is not supported by server	
	1794	Invalid index group	
	1795	Invalid index offset	
	1796	Reading/writing not permitted	
	1797	Parameter size not correct	
	1798	Invalid parameter value(s)	
	1799	Device is not in a ready state	
	1800	Device is busy	
	1801	Invalid context (must be in Windows)	
	1802	Out of memory	
	1803	Invalid parameter value(s)	
	1804	Not found (files, etc.)	
	1805	syntax error in command or file	
	1806	Objects do not match	
	1807	Object already exists	

Table 2-13 Error messages for Beckhoff ADS serial

Code	Subcode	Description	Possible Cause
70	1808	Symbol not found	
	1809	Symbol version invalid	
	1810	Server is in invalid state	
	1811	AdsTransMode not supported	
	1812	Notification handle is invalid	
	1813	Notification client not registered	
	1814	No more notification handles	
	1815	Size for watch too big	
	1816	Device not initialized	
	1817	Device has a timeout	
	1818	Query interface failed	
	1819	Wrong interface required	
	1820	Class ID is invalid	
	1821	Object ID is invalid	
	1822	Request is pending	
	1823	Request is aborted	
	1824	Signal warning	
	1825	Invalid array index	
	1856	Error class <client error>	
	1857	Invalid parameter at service	
	1858	Polling list is empty	
	1859	Var connection already in use	
	1860	Invoke ID in use	
	1861	Timeout elapsed	
	1862	Error in Win 32 subsystem	
	1864	Ads port not opened	
	1872	Internal error in ads sync	
	1873	Hash table overflow	
	1874	Key not found in hash	
	1875	No more symbols in cache	

2.4 Applications

2.4.1 Connection by AMS serial

For a connection by AMS serial you have to assign the AMS Net ID of the controller computer and the port number of the corresponding controller.

These data is read out of the TPY file by the programming software.

The data is included by the tags <RoutingInfo> </RoutingInfo>.

Example:

<RoutingInfo>
<AdsInfo>
<NetId>192.168.100.155.1.1</NetId>
<Port>801</Port>
</AdsInfo>
</(RoutingInfo>

Additionally you have to enter a Net ID and a port number for the operating device, even if you don´t connect it by ethernet.

For the port number of the operating device you enter a value greater or even 32768 in the programming software.

TwinCat System Control

Enter the parameters for the controller computer in the TwinCat System Control as follows:

1. Start the program **TwinCat System Control** on the controller computer.

The window **TwinCat System Properties** opens.

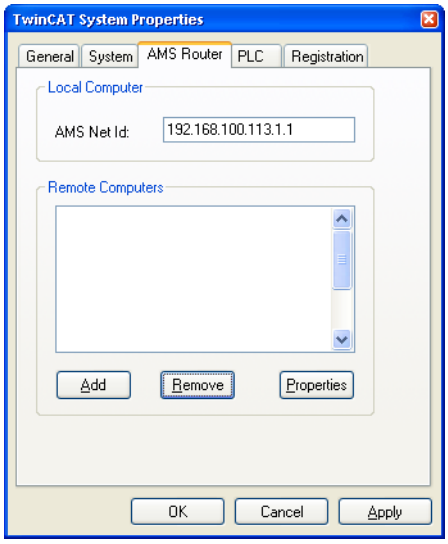


Figure 2-1 Window TwinCat System Properties

2. Open the **AMS Router** tab.
3. Click on the **Add** button.

The **Properties of remote connection** dialog opens.

You cannot enter any strings in the address field at the first call of the dialog. Enter the Name, AMS Net ID and Transport first and close the dialog. You can assign your COM interface at the second call.

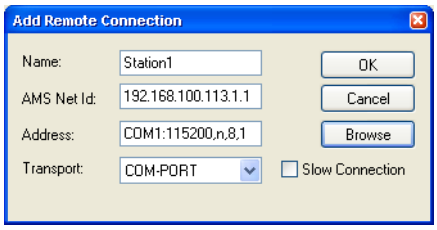


Figure 2-2 Properties of remote connection dialog

4. Enter a name for the controller computer in the **Remote name** field.
5. Enter a 6 digit ID in the **AMS Net ID** field. Take into account that the last two digits must have the value 1.
6. Select the item COM-PORT in the **Transmission** field.
7. Confirm with **OK**.

You return to the **TwinCat System Properties** window.

8. Select the new item in the **Remote Computer** field.
9. Click on the **Properties** button.
10. Enter the serial interface with any communication parameters in the **Address** field. The format is <COM-Port:>,<Baud rate>,<Parity>,<Data bits>,<Stop bits>.
11. Confirm with **OK**.

You return to the **TwinCat System Properties** window.

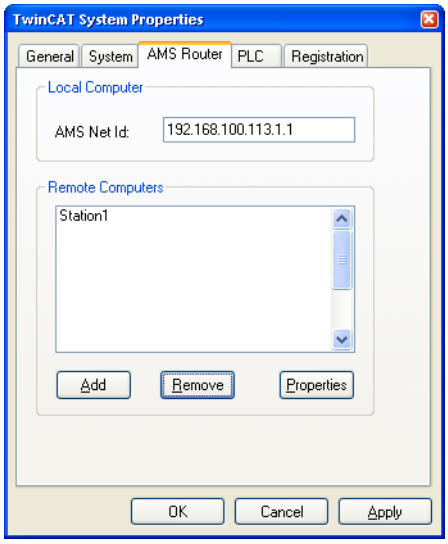


Figure 2-3 TwinCat System Properties window with entry

12. Confirm with **OK**.

You load the project (Bootproject) of TwinCAT PLC Control in the controller via this connection. Connect the control computer and the controller with the programming cable.

After you have loaded the project of TwinCAT PLC Control into the controller and the project of TSwin into the operating terminal, you can connect the control with the control unit.

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